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**DUKE POWER**

September 14, 1995

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

Subject: Catawba Nuclear Station, Unit 1  
Docket No. 50-413  
Special Report  
Invalid Failure of Diesel Generator 1A

Pursuant to Technical Specification 4.8.1.1.3 and 6.9.2, find attached a Special Report concerning the Unit 1 Diesel Generator (DG 1A) invalid failure which occurred on August 15, 1995.

Sincerely,

W. R. McCollum

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Attachment

xc: S. D. Ebnetter, Regional Administrator

R. E. Martin, ONRR

R. J. Freudenberg, SRI

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SPECIAL REPORT  
CATAWBA NUCLEAR STATION  
DOCKET NO. 50-413  
DIESEL GENERATOR 1A INVALID FAILURE  
DUE TO MAIN BEARING HIGH TEMPERATURE TRIP SIGNAL

An **invalid failure** of Diesel Generator (DG 1A) occurred on 08/15/95 due to a main bearing high temperature trip signal. It was determined that a failed splice installed in the circuit for Resistance Temperature Detector (RTD) 1LDRD5630 was the cause of the trip signal. Unit 1 was in Mode 1 (Power Operations) at 100% power when this failure occurred. There has been 1 valid failure in the last 20 valid tests and 3 valid failures in the last 100 valid tests on DG 1A. DG 1A was on a monthly test frequency at the time of this failure. The DG 1A was unavailable for 6.23 hours due to this invalid failure.

On 08/15/95, DG 1A was being prepared for the monthly operability test.

Following the air roll, the display for Main Bearing #5 RTD (1LDRD5630) was indicating ~ 300° F on the Rosemount Alarm Monitor. The other bearing indications were reading in their normal range (140 - 150° F). Work Order #95064091-01 was initiated to investigate and repair this problem.

During the process of performing initial checks, the temperature dropped to its normal reading. Instrument and Electrical (IAE) personnel checked all connections external to the engine for the RTD. The terminations in the junction box on the side of the engine were tightened slightly. The indication displayed a normal reading. Operations (OPS) proceeded with the DG 1A run. Approximately 20 minutes into the full load run, the annunciator for High Bearing Temperature trip was received and the engine automatically shutdown. The operators immediately went to the Rosemount Alarm Monitor and observed that the alarm light for 1LDRD5630 had actuated, however temperature for this point was agreeing with the other bearing RTDs. At this point, all work was halted on DG 1A and the Failure Investigation Process (FIP) was started.

The FIP team identified several possible equipment failure modes that would have led to the initiation of the High Bearing Temperature Trip. Each of these failure modes were tested. Using this process, it was discovered that a failed splice in the wiring for 1LDRD5630 was the root cause of the inadvertent trip.

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This same RTD had been replaced on 10/21/94, which is documented in Problem Investigation Process (PIP) #1-C94-1495 due to it failing high during an engine run. At that time, a splice was made inside the DG to connect the replacement RTD. One of the possible equipment failure modes identified by the FIP team on 08/15/95 was the bad splice from the previous installation. When the engine was entered to investigate the status of this splice, it was observed by the IAE crew that the condition of the Raychem heat shrink tubing, which had been used to insulate and protect the splice from the harsh lube oil environment, had changed from the earlier installation. The Raychem that covered the three butt splices had softened and expanded on the RTD wire. By gently touching this splice, the point for 1LDRD5630 on the Alarm Monitor would immediately increase and go into an alarm condition. This was indicative of an open circuit occurring in the RTD wiring at the point of the splice. IAE clipped the RTD wire and removed the RTD and its associated splice from the engine. The Raychem heat shrink area was then cut open to examine the internal butt splices. The individual splices were covered with electrical tape. The tape was removed and it was seen that the butt splice for the white wire had a broken wire on one side. It is not known whether most of the wire strands broke during initial installation, or whether engine vibration combined with the looseness of the heat shrink caused the wire strands to break at the point of the splice.

A new RTD was installed in Main Bearing #5. The cable was run through the conduit on the side of the engine and terminated in junction box 1TBOX0597. No splice was made inside the engine. The operability performance test was successfully completed on 08/16/95 (start #1076) and the DG 1A engine was declared operable.

The trip for high temperature on the main bearings is not an emergency trip function and would have been bypassed had an emergency start signal been received. The failure of this splice would not have affected the DG's ability to start and accept loads had it been needed for a design basis event. Therefore, this event is classified as an invalid failure.

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PIP 1-C95-1250 has been generated to address the incompatibility of the Raychem heat shrink with the lube oil environment and any other generic concerns involving splicing. Upon discovering the degraded splice in DG 1A, research was performed to determine if this same situation existed in any other DGs. It was determined that DG 2A and 2B each had one splice that utilized Raychem Heat Shrink inside the engine. DG 2A had a splice installed for 2LDRD5620 on 03/4/93 during the initial installation of the modification that replaced the pneumatic non-emergency trip system with an electronic system (NSM CN-20528) per VN CC-3682. A note was added at that time to CN-2777-01.15 that specified using Raychem Heat Shrink to cover the butt splices. DG 2B had a splice that involved the use of Raychem installed per Work Order #94081546-01 for 2LDRD5720 on 11/15/94 due to a previous erratic indication problem. There have been no problems seen with the indications for these two RTDs since the installation of these splices. Work Orders #95064971-01 and #95065069-01 were initiated and have been completed for DG 2A and DG 2B, respectively, to remove the RTDs with splices and replace them with ones where no splice is used in the installation. PIP 2-C95-1253 was initiated to address the note on CN-2777-01.15 that specifies using Raychem. Corrective Action (CA) #1 in that PIP has been assigned to ESE to delete that note from the drawing. The editorial minor mod to remove this note is scheduled to be completed by 02/16/96.